ORDER NO. SD7803-1348

Service Manual

Frequency Generator Servo Automatic Turntable System

SL-220 (X), (XAL), (E) (XGE), (XG), (XGF)

SL-221 (E), (X), (XAL) (XG), (XGF)

- The model SL-220(X) is available in Asia, Latin America, Middle East and Africa only.
- The model SL-220(XAL) is available in Australia only.
- The model SL-220(E) is available in Scandinavia only.
- The model SL-220(XGE) is available in England only.
- The model SL-220(XG) is available in European only.
- The model SL-220(XGF) is available in France only.
- The model SL-221(E) is available in Scandinavia only.
- The model SL-221(X) is available in Asia, Latin America, Middle East and Africa only.
- The model SL-221(XAL) is available in Australia only.
- The model SL-221(XG) is available in European only.
- The model SL-221(XGF) is available in France obly.
- SL-220 is of silver finish.
- SL-221 is of black finish.

Specifications

(Specifications are subject to change without notice for further improvement.)

General

Power supply:	~110-120/220-240V, 50 or 60 Hz
Power consumption:	3W
Dimensions: (W x H x D)	43.0 x 12.6 x 37.5 cm (16-59/64 x 4-31/32 x 14-49/64 inches)
Weight:	4.5 kg (9.9 lb.)

Turntable section

Type:	Frequency Generator Servo Automatic Turntable System (Auto-return, Auto-stop)
Drive method:	Belt drive
Motor:	Frequency Generator Servo DC motor
Turutable platter:	Aluminum die-cast, 30.4 cm (12")
Turntable speeds:	33-1/3 and 45 rpm
Pitch controls:	Individual adjustment controls, 6% adjustment range
Wow and flutter:	0.045% WRMS (JIS C5521) ±0.06% peak (IEC 98A Weighted)
Rumble:	−70 dB (IEC 98 Weighted)

Tonearm section

Type:	Universal tubular arm, staticbalanced type
Effective length:	230 mm (9-1/16")
Overhang:	15 mm (19/32")
Friction:	Within 7 mg (horizontally and vertically)
Effective mass:	13 g (without cartridge)
Tracking error angle:	Within 2°32' (at the outer groove of 30 cm (12") record) Within 0°32' (at the inner groove of 30 cm (12") record)
Offset angle:	22°
Adjustable stylus pressure range:	0 to 3 g (stylus pressure direct reading type)
Cartridge weight range:	5.5 to 8.5 g (14.5 ~ 17.5 g including headshell)
Headshell weight:	9 g

Cartridge section (for the SL-220A)

Type:	Moving magnetic stereo cartridge
Frequency response:	20 to 25,000 Hz
Output voltage:	2.5 mV, 1 kHz, 5 cm/sec. zero to peak lateral velocity (3.2 mV, 1kHz, 5 cm/sec. zero to peak 45° velocity)
Channel separation:	25 dB at 1 kHz
Channel balance:	Within 2 dB at 1 kHz
Load impedance:	47 kΩ to 100 kΩ
Stylus pressure:	1.75 ± 0.25 g
Replacement stylus:	EPS-270ED

Technics

Matsushita Electric Trading Co., Ltd.
P.O. Box 288, Central Osaka Japan

SL-220

TECHNISCHE DATEN

Spezifikationen Können infolge von Verbesserungen ohne Ankündigung geändert werden.

Allgemeine Daten

Netzspannung: ~110-120/220-240V, 50/60 Hz Wechselstrom
Leistungsaufnahme: 3W
Abmessungen: (B x H x T) 43,0 x 12,6 x 37,5 cm
Gewicht: 4,5 kg

Plattenspielerteil

Typ: Frequenzgenerater-Servo-Plattenpieler System (Hanuell)
Antrieb: Riemenantrieb
Motor: Frequenzgenerater-Servo-Motor
Plattenteller: Aluminium-Spritzguß 30,4 cmø
Plattenteller-Drehzahlen: 33-1/3 und 45 U/min
Gleichaufschwankungen: 0.045% WRMS (JIS C5521) ±0,06% bewertet Null-zu-Spitze (IEC 98A bewertet)
Rumpel-Geräusch-spannungsabstand: –70 dB (IEC 98A bewertet)

Tonarmteil

Typ: Universal-Rohrtonarm, statisch ausbalanciert
Effektive Länge: 230 mm
Überhang: 15 mm
Spurfehlwinkel: Innerhalb 2°32′ (bei der äußeren Rille einer 30 cm-Schallplatte) Innerhalb 0°32′ (bei der inneren Rille einer 30 cm-Schallplatte)
Kröpfungswinkel: 22°
Mechanischer Widerstand: weniger als 7 mg (horizontal, vertikal)
Effektive Masse: 13 g (ohne Tonabnehmer)
Auflagedruck-Einstellbereich: 0 – 3 g (direkt ablesbare Eirstellung)
Zulässiger Tonabnehmer-Gewichtbereich: 5,5 – 8,5 g 14,5 – 17,5 g (einsch ließich Tonarmkopf)
Tonarmkopf-Gewicht: 9 g

Tonabnehmerteil

Modell-Nummer: EPC-270C-X
Typ: Magnetischer Tonabnehmer
Frequenzgang: 20 Hz to 25 kHz –3 dB 20 Hz to 15 kHz ±2 dB
Ausgangsspannung: 3,2 mV bei 1 kHz 5 cm/sec Null-zu-Spitze, lateral 6,4 mV bei 1 kHz 10cm/sec Null-zu-Spitze, lateral, (DIN 45500)
Kanaltrennung: 25 dB bei 1 kHz
Kanalabweichung: Innerhalb 2 dB bei 1 kHz
Nachgiebigkeit (dynamisch): 10×10^{-6} cm/dyn bei 100 Hz (CBS STR-100)
Auflagekraft: 1,75 ±0,25 g (17,5 ±2.5 mN)
Impedanz: 47 kΩ bis 100 kΩ
Gewicht: 6,0 g (ohne Tonarmkopf)
Ersatznadel: EPS-270ED

CARACTERISTIQUES TECHNIQUES

Sujet à changement sans préaris.

Généralités

Alimentation: Alternatif 110-120/220-240V, 50 ou 60 Hz.
Consommation: 3W.
Dimensions: (LxHxP) 43,0 x 12,6 x 37,5 cm.
Poids: 4,5 kg.

Platine de lecture

Type: Système de platine servo, réglable à générateur de fréquences.
Système d'entraînements: Entraînement par courroie.
Moteur: Servo, moteur c.c. á générateur de fréquences.
Plateau de lecture: Aluminium moulé sous pression. Diamètre 30,4 cm.
Vitesses de rotation: 33-1/3 et 45 t/p.m.
Commandes de precision de la viresse: Commandes de réglage individuelles; plage de réglage de 6%.
Pleurage et scintillement: 0,045% de valeur efficace (JIS C5521). ±0,06% de crête (IEC 98A Pondéré).
Ronflement: –70 dB (IEC 98A Pondéré).

Bras de lecture

Type: Bras tubulaire universel de type à équilibrage statique.
Longueur effective: 230 mm.
Porte à faux: 15 mm.
Angle d'erreur de piste: En decà de 2°32′ (au sillon exrérieur d'undisque de 30 cm.) En decà de 0°32′ (au sillon intériéur d'un disque de 30 cm.)
Angle de décalage: 22°
Frottement: Moins de 7 mg (horizontal et vertical).
Masse réelle: 13 g (sans la cellule pick-up).
Plage de réglage de la pression d'appui: 0 – 3 g (type à lecture directe de la pression d'appui de la pointe).
Gamme de poids de la cellule pick-up utilisable: 5,5 – 8,5 g. 14,5 – 17,5 g (ycompris la coque porte, cellule).
Poids de la coquille porte-cellule: 9 g.

Cellule pick-up

No. du modèle: EPC-270C-X.
Type: Aimant mobile.
Réponse en frèquence: 20 Hz à 25 kHz –3 dB. 20 Hz à 15 kHz ±2 dB.
Tension de sortie: 3,2 mV à 1 kHz. 5 cm/sec., zéro à vitesse latérale de crête. 6,4 mV à 1 kHz, 10 cm/sed., zéro à vitesse latérale de créte (DIN 45500).
Séparation de canal: 25 dB à 1 kHz.
Equilibrage des canaux: En decá de 2 dB à 1 kHz.
Elasticite (dynamique) 10×10^{-6} cm/dyne à 100 Hz (CBS STR-100).
Pression de la pointe de lecture: 1,75 ±0,25 gramme (17,5 ±2,5 mN).
Impédance de charge: 47 kΩ to 100 kΩ.
Poids: 6,0 grammes (cellule seule).
Pointe de lecture de remplacement: EPS-270ED.

■ PARTS IDENTIFICATION

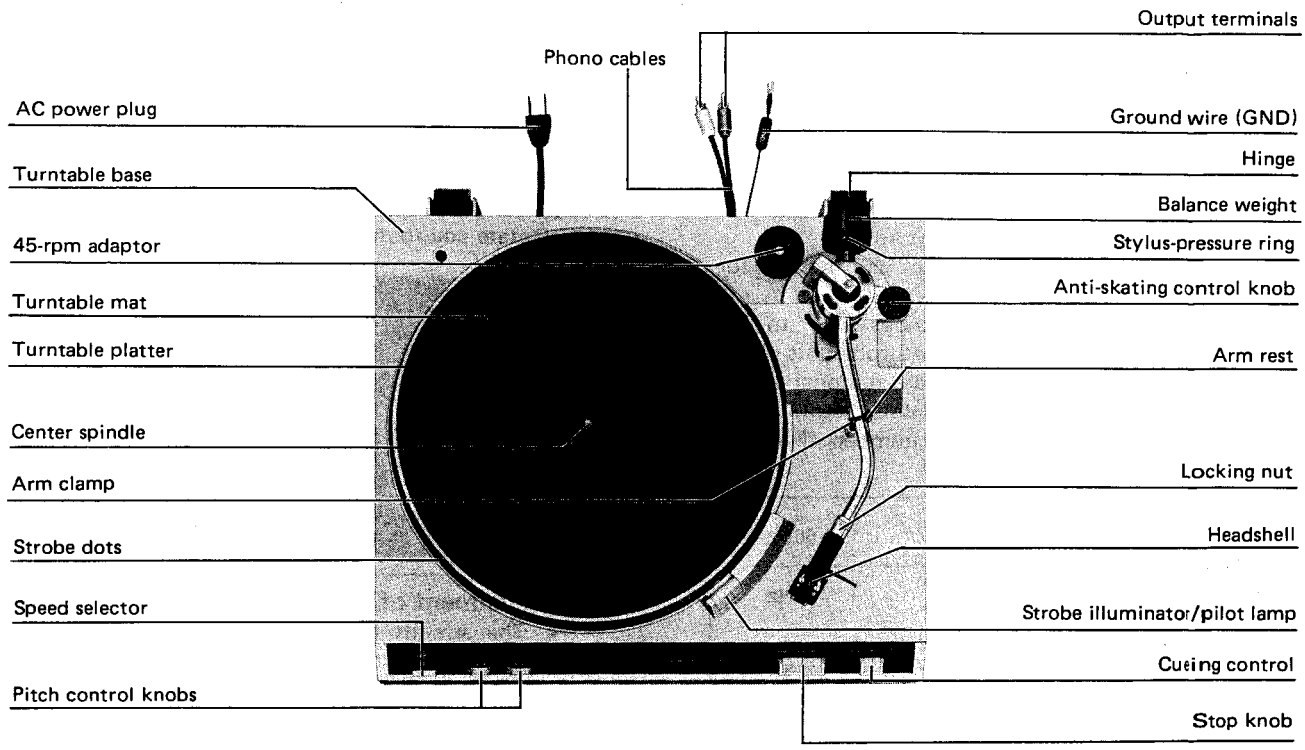


Fig. 1

■ FEATURES

New Type Frequency Generator Servo Control
One of the major secrets behind the razor-sharp accuracy and superb quality of sound lies in the new type (Frequency Generator) servo controlled DC motor, and greatly improved highly rellable IC circuitry. Even the slightest hint of speed change and drift is corrected immediately.

Electronic Speed Switching
Even though this turntable is belt-driven, gone is the old conventional pulley type speed changing mechanism. Speed switching in this unit is fully electronic, thereby adding to the high degree of mechanical precision and reliability.

All Front-Panel Controls
The advancement to complete front-panel control marks a big step forward in turntable operation, not only because of the greater convenience, but also because of the greater protection from dust, as the dust cover can stay closed.

Tonearm Cueing Controlled from Front Panel
The tonearm is raised and lowered softly by a viscous-damped cueing lifter. Even with the dust cover closed, a cueing can be easily performed as the control is located on the front panel.

High Sensitive Gimbal Suspension
The recently developed high sensitivity tonearm bearings featured in this unit achieve a very high degree of performance. In addition, the universal-type detachable headshell features all gold-plated pin connections to ensure unwavering reliability through many years of use.

Independent Pitch Controls
Permits record speed (at both 33-1/3 and 45 rpm) to be varied by up to 6%.

Precision Strobe Illuminator/Pilot Lamp
With the built-in strobe illuminator/pilot lamp, accurate speed adjustments can be made rapidly and easily.

Anti-Skating Force Mechanism
The well-designed anti-skating force mechanism ensures minimum side thrust with different cartridges and guarantees accurate center-of-the-groove tracking.

Automatic Tonearm Return
For greater operational convenience, the tonearm returns to the arm rest automatically, followed by automatic shut-off of the motor.

Detachable Dust Cover

■ ADJUSTMENTS

Speed adjustment (with pitch control knobs) (See Fig. 2)

Strobe dots are set on the rim of the turntable platter according to the power-time frequency and the number of revolutions of the records. Make adjustment, referring to strobe-dot indication.

1. Place a record on the turntable mat.
2. Set the speed selector to the speed to be adjusted.
3. Adjust the speed while playing a record.
   The strobe-illuminator/pilot lamp will be lit for illuminating the strobe dots.
4. While turning the pitch control knobs either to "+" side or "–" side, adjust so that the strobe dots of the turntable platter look as if they were stationary. The state under which the strobe dots seem to be stationary represents the correct number of revolutions.

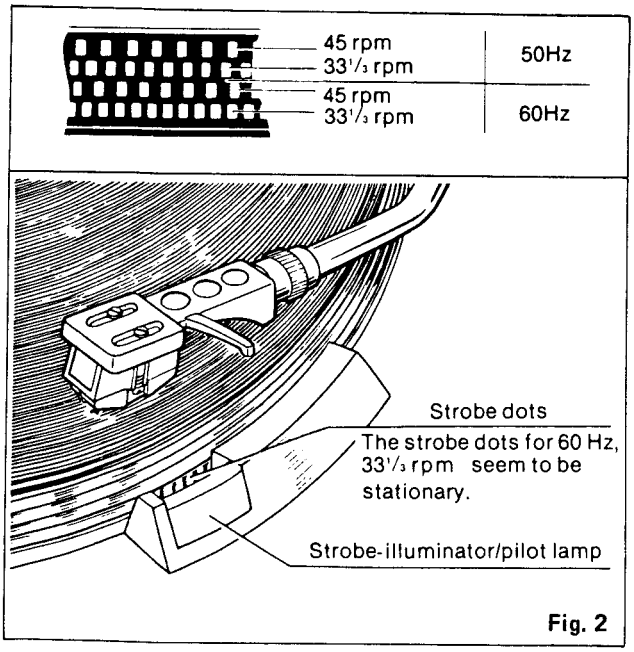


Fig. 2

"+" direction

This increases the speed of the turntable rotation, and the strobe dot pattern seems to flow in the same direction as the rotational direction of the turntable platter.

"–" direction

This decrease the speed of the turntable rotation, resulting in a state opposite to that in the "+" direction.

Note:

Strobe dot pattern

The strobe-illuminator/pilot lamp of this unit employs the commercially available power source. The frequency of such power source, when actually measured, has a fluctuation of about 2%. As such a fluctuation of the power source affects the strobe illuminator, the strobe dot pattern also seems to fluctuate to a certain extent. But the unit is not affected by these fluctuations of the power source, since a DC motor is employed. In other words, rotation of the platter will be constant, and slight shifts in the movement of the dots simply reflect normal drift in the power-source frequency.

Adjustment for automatic return position (See Fig. 3)

(Remove the turntable mat.)

In cases where the tonearm tends to return before playing has finished.

–Rotate clockwise.

In cases where the tonearm fails to return after the last groove of the record.

–Rotate counterclockwise.

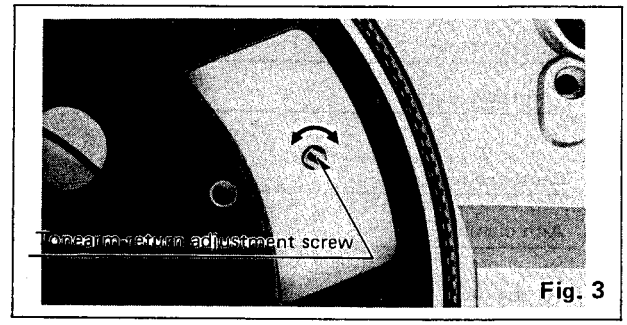


Fig. 3

Adjustment of arm-lift height (See Figs. 4 and 5)

- The arm-lift height distance between the stylus tip and record surface when cueing control is at "▼" has been adjusted at the factory before shipping to approximately 5 to 10 mm.
- For using different cartridges available on the market or when further adjustments are particularly necessary, make adjustment as follows:

1. Put on the stylus protector to protect the stylus tip from damage.
2. Set the speed selector to the "•" position to prevent the turntable platter from rotation.
3. Turn the adjustment screw clockwise or counterclockwise, while pushing the arm lift down. (See Fig. 4.)

   Clockwise rotation
   – distance between the record and stylus tip is reduced.

   Counterclockwise rotation
   – distance between the record and stylus tip is increased.

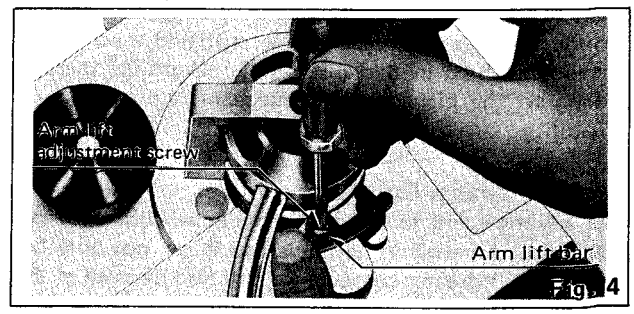


Fig. 4

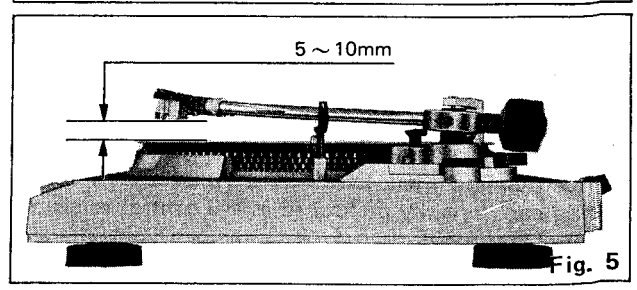


Fig. 5

■ JUSTIERUNGEN

Geschwindigkeits-Feineinstellung (mittels der Feineinsteller) (Vgl. Abb. 2)
Die Stroboskoppunkte sind auf dem Plattentellerrand entsprechend der Stromfrequenz und der Drehzahl der Schallplatten angebracht. Richten Sie sich bei der Drehzahl-Feineinstellung nach dem Stroboskopbild. **(Vgl. Abbl 2.)**

1. Legen Sie eine Schallplatte auf den Plattenteller.
2. Stellen Sie den Geschwindigkeitsumschalter auf die zu regulierende Geschwindigkeit ein.
3. Regulieren Sie die Geschwindigkeit während dem Abspielen de Platte.
   Die Stroboskoplampe/Einschaltkontrollampe leuchtet zur Beleuchtung der Stroboskoppunkte.
4. Regulieren Sie durch Drehen der Einstellknöpfe in "+" oder "–" Richtung, solange, bis die Stroboskoppunkte den Anschein vermitteln, daß sie stillstehen.
   Der Zustand, in dem die Stroboskoppunkte scheinbar stationär verbleiben, stellt die korrekte Drehgeschwindigkeit dar.
   "+" **Richtung**
   Die Drehgeschwindigkeit des Plattentellers erhöht sich, und die Stroboskoppunkte scheinen in der gleichen Richtung zu laufen, wie der Plattenteller.
   "–" **Richtung**
   Die Drehgeschwindigkeit des Plattentellers verringert sich, und die Stroboskoppunkte laufen in der, der Drehrichtung des Plattentellers entgegengesetzten Richtung.

Anmerkung:
Stroboskoppunktemuster
Die Stroboskoplampe/Kontrollampe dieses Gerätes arbeitet mit normalem Netzstrom. Die Frequenz dieser Stromquelle besitzt einen Schwankungsbereich von 0,2%. Da eine solche Schwankung der Stromquelle die Stroboskoplampe beeinflußt, scheint das Punktemuster auch zu einem gewissen Grad zu fließen. Die Drehzahl des Plattentellers wird jedoch durch diese Schwankung nicht beeinflußt, da ein Gleichstrommotor den Plattenteller antreibt.
Anders ausgedrückt, die Umdrehungsgeschwindigkeit des Plattentellers bleibt konstant, und die geringfügige Bewegung des Stroboskoppunktemusters entspricht lediglich der normalen Schwankung der Netzfrequenz.

Einstellen des Abschaltpunktes der Automatik (Vgl. Abb. 3.)
(Die Plattentellerauflage abnehmen.)
Falls der Tonarm zu früh zurückkehrt.
– In Uhrzeigerrichtung drehen.
Falls der Tonarm nach Erreichen der Auslaufrille nicht zurückkehrt.
– In Gegenuhrzeigerrichtung drehen.

Einstellung des Tonarmlifts (Vgl. Abb. 4 und 5.)
- Die Tonarmlifthöhe, d.h. der Abstand zwischen der Schallplattenoberfläche und der Nadelspitze, wenn der Lift-Schieber in der " ▼ " Position ist, wurde vor der Auslieferung auf ungefähr 5–10 mm eingestellt.
- Für die Benutzung anderer Tonabnehmer, die auf dem Markt erhältlich sind, oder, falls eine weitere Justierung unbedingt erforderlich ist, nehmen Sie die Justierung auf folgende Weise vor:

1. Setzen Sie den Nadelschutz auf, um die Nadel vor Schaden zu schützen.
2. Stellen Sie den Geschwindigkeitsumschalter in die "•" Position, damit sich der Plattenteller nicht dreht.
3. Führen Sie den Tonarm gegen die Plattentellerachse.
4. Drehen Sie die Justierschraube im Uhrzeigersinn oder Gegenuhrzeigersinn, währenddem Sie die Tonarmliftführung nach unten drücken. **(Vgl. Abb. 4)**
   Im Uhrzeigersinn
   – Der Abstand wird kleiner.
   Im Gegenuhrzeigersinn
   – Der Abstand wird größer

■ REGLAGES

Réglage de la vitesse (avec les boutons de réglage de précision) (Voir Fig. 2.).
Les points du stroboscope se trouvent disposés sur le bord du plateau du tourne-disque en fonction de la fréquence de durée de puissance et du nombre de révolutions des disques. Effectuer le mise au point, en se référant aux indications des points stroboscopiques. **(Voir Fig. 2.).**

1. Placer un disque sur le tapis du plateau de lecture.
2. Disposer le sélecteur de vitesse sur la vitesse devant être mise au point.
3. Régler la vitesse tout en faisant jouer un disque.
   La lampe-témoin/eclairage du stroboscope s'allumera pour éclairer les points stroboscopiques.
4. Il faut tourner les boutons de réglage de précision suffisamment, soit dans le sens "+" soit dans le sens "–", pour que les points du stroboscope du plateau de lecture paraissent stationnaires.
   L'état dans lequel les points du stroboscope paraissent immobiles représente le nombre correct de révolutions.
   Sens "+"
   Ce sens accroît la vitesse de rotation du plateau et les points du stroboscope semblent se déplacer dans le sens de rotation du plateau.
   Sens "–"
   Ce sens diminue la vitesse de rotation du plateau, son effet est contraire à celui du sens "+".

Nota:
Imdge des points stroboscopiques
La lampe témoin/éclairage du stroboscope de cet appareil utilise une alimentation disponible commercialement.

S'il se produit une vibration de la fréquence du courant d'alimentation de l'appareil, il se peut que l'on observe un léger déplacement des points du stroboscope.
Bien que le courant du secteur soit en général très stable en ce qui concerne la fréquence, si l'on procède à des mesures précises sur une durée suffisamment longue, il est possible d'observer une variation qui, en moyenne, est de l'ordre de 0.2%. Ce sont ces variations qui provoquent le déplacement des points du stroboscope.

Mais l'appareil n'est pas affecté par ces variations, étant donné qu'un moteur à courant continu est utilisé. En d'autres mots, la rotation du plateau restera constante, et les légères variations dans le mouvement des points ne reflètent simplement qu'une déviation normale dans la fréquence de la source d'énergie.

Mise au point pour une position de retour automatique. (Voir Fig. 3.).
(Retirer le tapis du plateau de lecture.)
Dans le cas où le bras de lecture tend à revenir avant que l'audition ne soit terminée.
– Dèplacer dans le sens des aiguilles d'une montre.
Dans le cas où le bras de lecture ne peut revenir en arrière après le dernier sillon du disque.
– Déplacer dans le sens contraire des aiguilles d'une montre.

Mise au point de la hauteur de l'élévateur du bras. (Voir Figs. 4 et 5.).
- La hauteur du bras élévateur (distance entre l'extrémité de la points de lecture et la surface du disque, lorsque la commande de pose et de relevage est sur " ▼ ") a été mise au point en usine avant d'être expédiée, sur une hauteur approximative de 5 à 10 mm.
- Lorsqu'on utilise une des diverses cellules pick-up disponibles sur le marché ou lorsqu'une mise au point ultérieure est particulièrement nécessaire, faire le réglage de la façon suivante:

1. Placer le dispositif protecteur de la pointe de lecture pour protéger la tête de la pointe d'une éventuelle détérioration.
2. Régler le sélecteur de vitesse sur la position "•", pour empêcher la rotation du plateau de lecture.
3. Déplacer le bras de lecture vers le pivot cent
4. Tourner la vis de réglage dans le sens des aiguilles d'une montre ou dans le sens inverse, tout en abaissant l'élévateur du bras **(Voir Fig. 4.).**

Rotation dans le sens des aiguilles d'une montre.
– La distance entre la surface du disque et l'extrémité de la pointe de lecture diminue.
Rotation dans le sens contraire des aiguilles d'une montre.
– La distance entre la surface du disque et l'extrémité de la pointe de lecture augmente.

■ CHECK POINTS

(A) Switching on does not cause turntable to rotate

↓

1) Check the line power circuit
2) Check for 12V DC between ⊕ – ⊖

↓ OK

3) Check speed selector switch
a) Faulty contact b) Soldered improperly — BAD → a) Replace speed selector switch b) Solder securely

↓ OK

4) Check VR1, VR2, VR3 or VR4
a) Faulty b) Soldered improperly — BAD → a) Replace VR1, VR2, VR3 or VR4 b) Solder securely

↓ OK

5) Separate motor and the F.G. SERVO P.C.B.

↓

6) Confirm that motor rotates with 5V DC applied between the red lead (Positive) and the blue lead (Negative) separate source and see that the noload is about 20mA — BAD → Replace motor

↓ OK

Replace F.G. SERVO P.C.B.

(B) Turntable rotates abnormally

↓

1) Adjust VR1, VR2, VR3 or VR4 → When the strobo dots appear to be stationary, the speed is accurate

↓ STILL ABNORMAL

3) Check VR1, VR2, VR3 & VR4 or speed selector switch
a) Faulty contact b) Soldered improperly — BAD → a) Replace VR1, VR2, VR3 & VR4 or speed selector switch b) Solder securely

↓ OK

4) Check for 12V DC and a ripple voltage of about 0.5Vp-p between ⊕ – ⊖ — BAD → Check ripple filter and diodes If faulty, replace

↓

5) Separate motor and the F.G. SERVO P.C.B.

↓

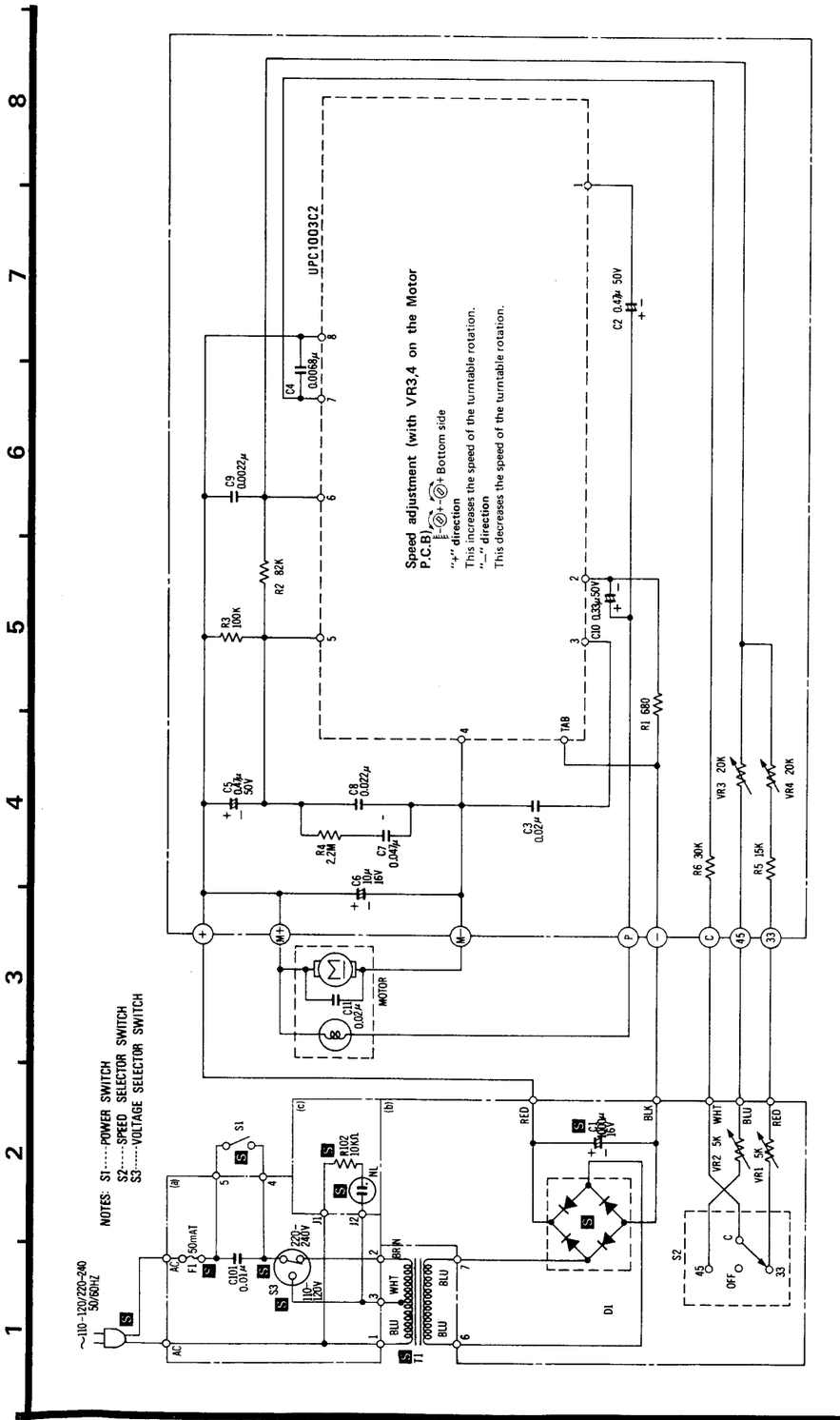
6) Connect a separate 5V DC power supply between the red lead (positive) and the blue lead (negative) of the motor.
Motor should rotate. Connect oscilloscope between the white lead (positive) and the red lead (negative) of the motor.
Confirm that thare is about 120mVp-p. — BAD → Replace motor

↓ OK

7) Replace F.G. SERVO P.C.B.

■ SCHEMATIC DIAGRAM

This schematic diagram may be modified at any time with the development of new technology.



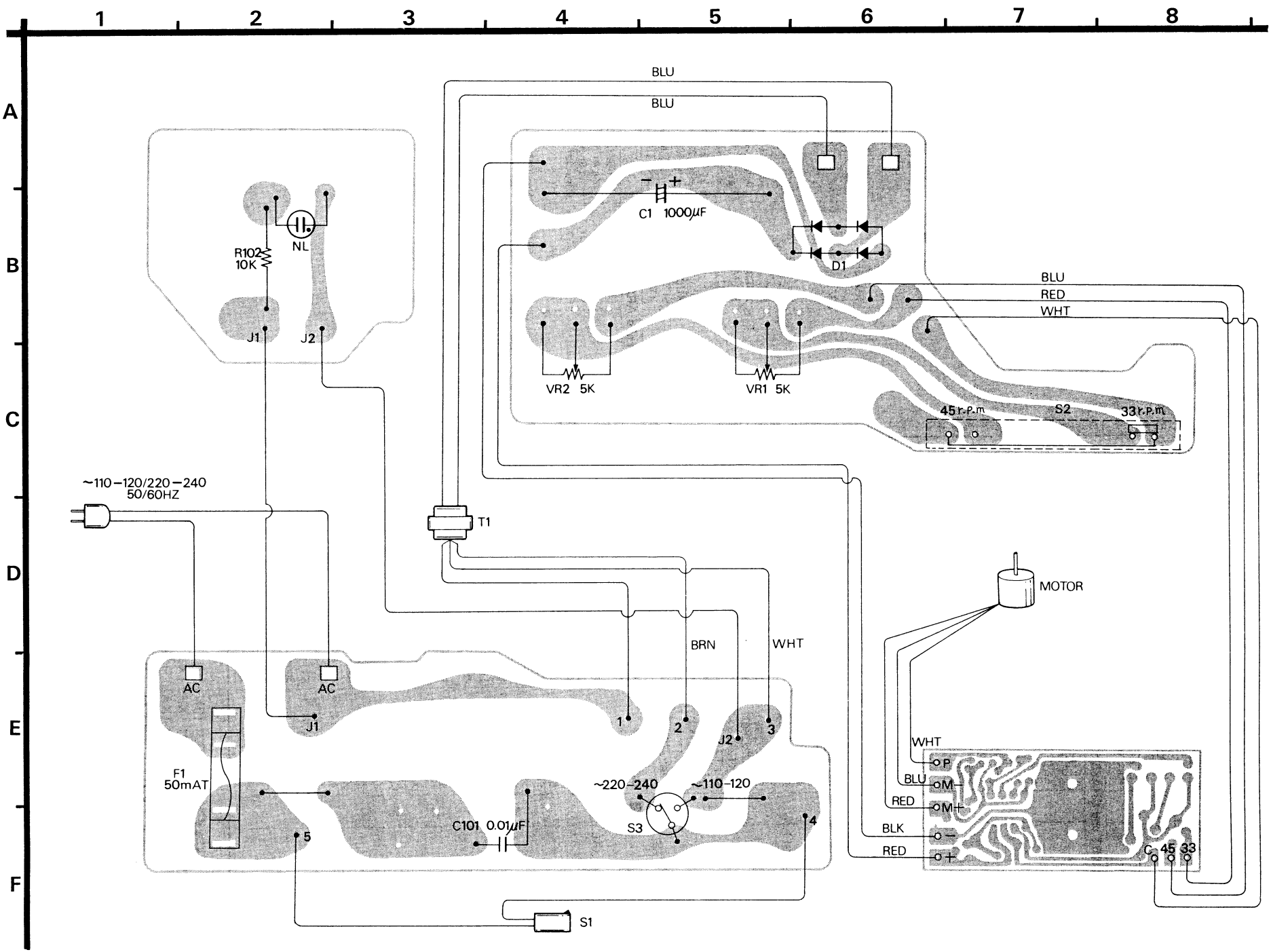
Ref. No.		Part No.
DIODE		
D1	S	SVDS1RBA20
TRANSFORMER		
T1	S	SLTMPT-033
CAPACITORS		
C1	S	ECEB1CS102
C101 [X,XG,XGF]	S	ECQE2A103MZ
C101 [XAL,XGE E]	S	ECKDHS103SE
RESISTORS		
R102	S	ERG1ANJ103
VARIABLE RESISTOR		
VR1, 2		EVHX8AF15B53
VR3, 4		EVN31AA00B24
LAMP		
NL1	S	SFDNE2HU
SWITCHES		
S1 [X,XG,XGF]	S	SFDSAH764039
S1 [XAL, XGE, E]		V-1A445
S2		EVAH255BBAAF
S3	S	SFDSHXW13312
FUSE		
F1	S	XBA2C005TR0

Notes: 1. Guide letters of Resistor and Capacitor indicate:
Resistor
ERG . . . . Metal oxide
Capacitor
ECEB. . . Electrolytic
ECKD . . Ceramic
ECQE. . . Polyester

2. S indicates that only parts specified by the manufacturer be used for safety.

3. SL-220 (X)→[X], SL-220 (XAL)→[XAL]
SL-220 (E)→[E], SL-220 (XGE)→[XGE]
SL-220 (XG)→[XG], SL-220 (XGF)→[XGF]

■ CIRCUIT BOARD WIRING VIEW

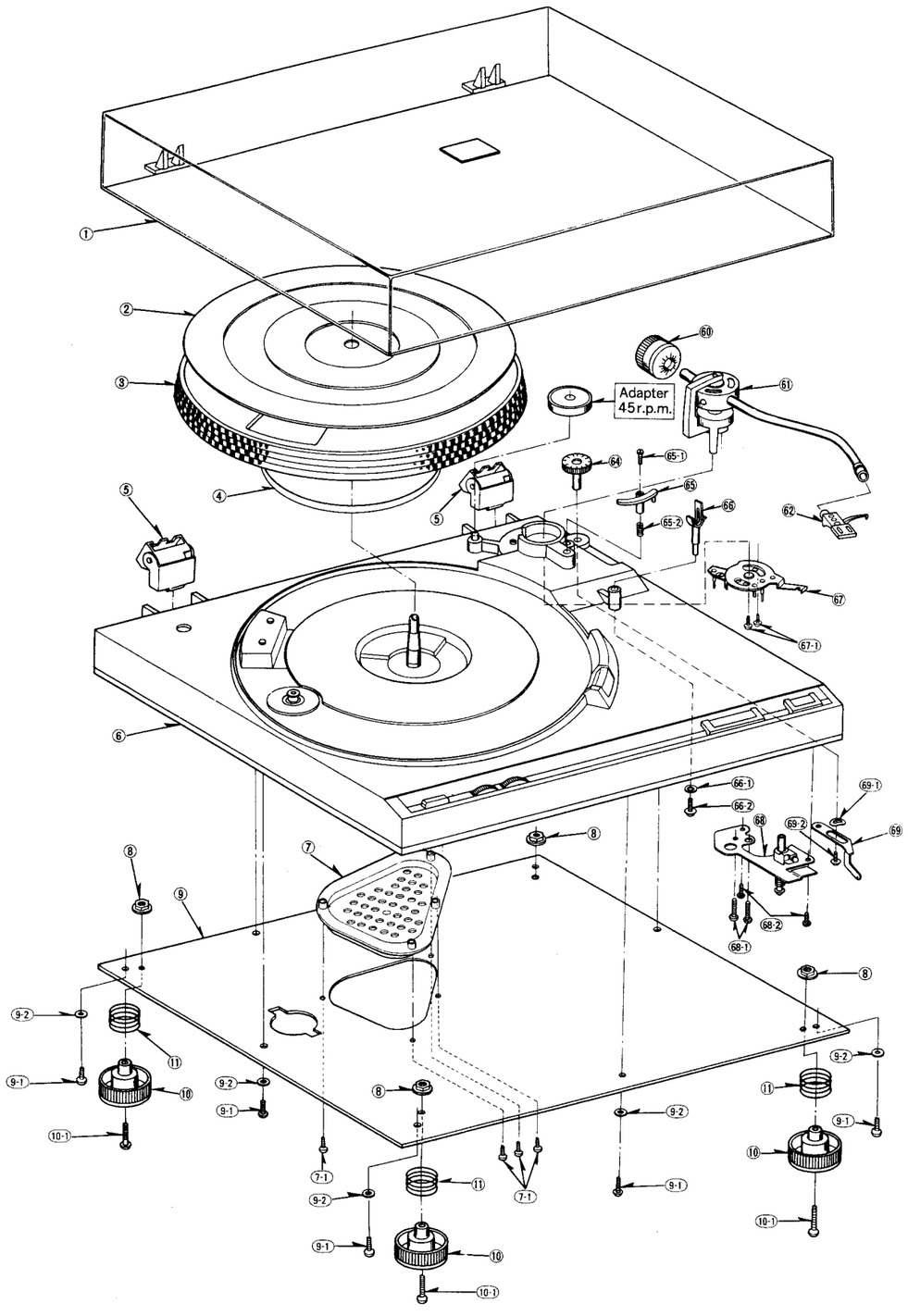


■ TROUBLE SHOOTING GUIDE

* Except when checking voltage, disconnect the power cord before repair without fail.

TROUBLE	CAUSE	REMEDY
Turntable speed A. Switching on does not cause turntable to rotate.	1. Come off belt from capstan (Remove bottom cover and, using DC voltmeter, check printed base voltage)	Install the belt to capstan.
	2. No output of constant-voltage circuit (1) No output on secondary of transformer. * Cord disconnected. * Soldered improperly.	* Replace cord. * Solder securely.
	* Power transformer defective.	* Replace power transformer.
	3. Output of cnstant-voltage circuit is 9.6 ~ 14.4V. * Motor ass'y defective.	* Replace motor ass'y.
	4. Speed selector switch defective * Contact faulty. * Soldered improperly.	* Replace speed selector switch. * Solder securely.
B. Turntable speed too slow.	1. Constant-voltage output is not 9.6V ~ 14.4V. * Power transformer defective.	* Replace power trans.
	2. Constant voltage output is 9.6V ~ 14.4V. * Motor ass'y defective. * Speed unadjusted.	* Replace motor ass'y. * Adjust semi-fixed resistor VR3 & VR4.
C. Turntable speed too fast.	1. Constant-voltage output is not 9.6 ~ 14.4V. * Power transformer defective.	* Replace power transformer.
	2. Constant-voltage output is 9.6V ~ 14.4V. * Motor ass'y defective. * Speed unadjusted.	* Replace motor ass'y. * Adjust semi-fixed resistor VR3 & VR4.
D. Turntable speed varies too much.	* Motor ass'y defective. * Belt defective.	* Replace motor ass'y. * Replace belt.
E. Turntable. after stopped by hand. will not tusn or starts turning but will stop soon.	* Motor ass'y defective.	* Replace motor ass'y.
F. Operative at only one of two speeds. (33-1/3 r.p.m or 45 r.p.m)	* Speed selector switch defective. * Leadwire disconnected or unsoldered. * Contact of VR1, VR2 insufficient.	* Replace speed selector switch. * Replace leadwire, or solder securely. * Replace printed base ass'y.
G. When actuating, turntable speed is unsteadly for a long time.	* Motor ass'y defective.	* Replace motor ass'y.
Noise Offensive noise is hears.	* Power transformer makes loud noise of vibration.	* Replace power transformer.

■ EXPLODED VIEW



■ REPLACEMENT PARTS LIST

Notes: 1. Part numbers are indicated on most mechanical parts.
Please use this part number for parts orders.
2. S indicates that only parts specified by the manufacturer be used for safety.
3. SL-220 (X)→[X] SL-220 (E)→[E], SL-220 (XG)→[XG].
SL-220 (XAL)→[XAL], SL-220 (XGE)→[XGE], SL-220 (XGF)→[XGF].

Ref. No.		Part No.	Part Name & Description
CABINET and CHASSIS PARTS			
1		SFAD350-01E	Dust Cover
2		SFTG301-01	Turntable Mat
3		SFTE301-01	Turntable
4		SFGB321-1	Belt
5		SFAT301-01A	Hinge Ass'y
6		SFAC212-01	Cabinet
7		SFUM222-20	Cover, Gear
7-1		XTN3+16B	Screw, Gear Cover
8		SFXN212-01	Nut, Insulator
9		SFAU222X01	Bottom Board
9-1		XTN3+16B	Screw, Bottom Board
9-2		XWG3	Washer, Bottom Board
10		SFGA212-01	Insulator
10-1		XSN3+14S	Screw, Insulator
11		SFQC212-01	Spring, Insulator
12		SFDH212-01	Phono Cord
13		SFEL028-01E	Ground Wire
14		SFUM212-08	Clamper, Phono Cord
15		SFUP212-12	Plate, Shield
15-1		XTN3+10B	Screw, Shield Plate
16 [X,XG,XGF]		SFNN222X01	Name Plate
16 [XAL,XGE]		SFNN222G01	Name Plate
16 [E]		SFNN222S01	Name Plate
17		SFKT212-01	Knob, Speed Adjustment
18		SFKT212-03	Knob, Power Switch
19		SFKT212-04	Knob, Cueing
20		SFKK222X01	Panel
21		SFGK170-01	Cap, Rubber
22 [X,E,XG, XGF]	S	RJA23ZC-K	AC Cord
22 [XAL]	S	QFC1208M	AC Cord
22 [XGE]	S	RJA45ZC-K	AC Cord
23 [Except XAL]		SFUM190-11	Bushing, AC Cord
23 [XAL]		SFUM190-12	Bushing, AC Cord
23-1		XTN3+10B	Screw, P.C.B.
24		SFGC212-03	Rubber, Power Transformer
24-2		SFXG212-03	Screw, Power Transformer
24-3		SFUP212X01	Plate, Power Transformer
25	•	SFMH212-01R	Motor W/Capstan
25-1		FEEGA595	P.C.B. Ass'y, Motor
25-2		XTN3+10B	Screw, Motor P.C.B. Ass'y
26		SFGC020L01	Rubber, Motor
26-1		SFXG023L01	Screw, Motor
26-2		**XUC3FT**	Circlip, Motor Screw
26-3		XWE4D8BW	Washer, Motor Screw
27		SFUP212-13	Shutter A
28		SFUP212-07	Shutter B
29		SFUP212-11	Plate, Speed Adjustment
30		SFKT212-02	Knob, Speed Adjustment
30-1		XTN3+10B	Screw, Speed Adjustment Plate
31		SFUM212-02	Plate, Operation
31-1		SFUP212-20E	Slider Ass'y
32		SFUM212-03E	Slider Ass'y
32-1		XTN3+20B	Screw, Slider Ass'y
33		SFQA130-11	Spring, Slider Ass'y
34		SFYB5-32	Ball, Slider Ass'y
35		SFUP212-06	Case, Operation
36		SFUM212-07	Cover, Neon
36-1		XTN3+10B	Screw, Neon Cover
37		SFUP212-04	Lever, Cueing
37-1		SFXW190-22	Washer, Cueing Lever
37-2		**XUC5FT**	Circlip, Cueing Lever
38		SFUK230-02E	Plate, Cueing Lever
38-1		XTN3+10B	Screw, Cueing Lever Plate
39		SFUP222-01	Lever, Start
39-1		**XUC3FT**	Circlip
39-2		SFQP230-01	Support, Start Lever
39-3		XTN3+5B	Screw, Support
40		SFUK222-11E	Automatic Mechanism Ass'y
41		SFUM222-14	Cover, Switch
41-1		XTN3+10B	Screw, Switch Cover
42		SFUC222-11E	Actuating Plate Ass'y
42-1		XUC3FT	Circlip, Actuating Plate Ass'y
43		SFUB222-11A	Operating Plate Ass'y
43-1		**XUC5FT**	Circlip, Operating Plate Ass'y
43-2		SFXW623-02	Washer, Operating Plate Ass'y
43-3		SFXW130-13	Washer, Operating Plate Ass'y
44		SFUM222-15	Plate, Switch
45		SFUM222-13	Plate, Stop
46		SFQS222-12	Spring, Stop Plate
47		SFUM222-16	Lever, Switch
47-1		**XUC3FT**	Circlip, Switch Lever
48		SFUM222-11	Support, Gear Setting
49		SFQS222-11	Spring, Support
50		SFUG190-22E	Main Gear Ass'y
50-1		SFXW890B01	Washer, Main Gear Ass'y
50-2		**XUC5FT**	Circlip, Main Gear Ass'y
51		SFTU222-11E	Shaft, Turntable
51-1		XTN3+10J	Screw, Turntable
TONE ARM and ARM BASE			
60		SFPWG21001K	Balance Weight Ass'y
61		SFPAM21001K	Tone Arm Ass'y
62		SFPCC22101K	Head Shell
63 [Except XGE]		EPC270C2K-X	Cartridge
63-1 [Except XGE]		EPS270ED	Stylus
63-2 [Except XGE]		SFPEN3302	Nut, Cartridge
63-3 [Except XGE]		SFPEV9802	Screw, Cartridge
63-4 [Except XGE]		SFPEW9601	Washer, Cartridge
64		SFPJK19004	Knob, Anti-skate Force Control
65		SFPRT13003K	Lift Ass'y
65-1		SFXG829-1	Screw, Tone Arm Lift Adjustment
65-2		SFQA829-03	Spring, Lift Ass'y
66		SFKU212-01E	Arm Rest
66-1		XWG3	Washer, Arm Rest
66-2		XTN3+14BFZ	Screw, Arm Rest
67		SFUP222-02A	Tone Arm Fixing Plate Ass'y
67-1		SFPEV13204	Screw, Tone Arm Fixing Plate Ass'y
68		SFUP212-01A	Bracket, Lift Ass'y
68-1		XTN4+12B	Screw, Lift Ass'y Bracket
68-2		XTN3+10B	Screw, Lift Ass'y Bracket
69		SFUP212-02	Plate, Anti-skate Force Control
69-1		SFXW831-5	Washer, Plate
69-2		XTN26+6B	Screw, Plate

SL-221

SL-221 (E)→[E], SL-221 (XG)→[XG]
SL-221 (X)→[X], SL-221 (XGF)→[XGF]
SL-221 (XAL)→[XAL],

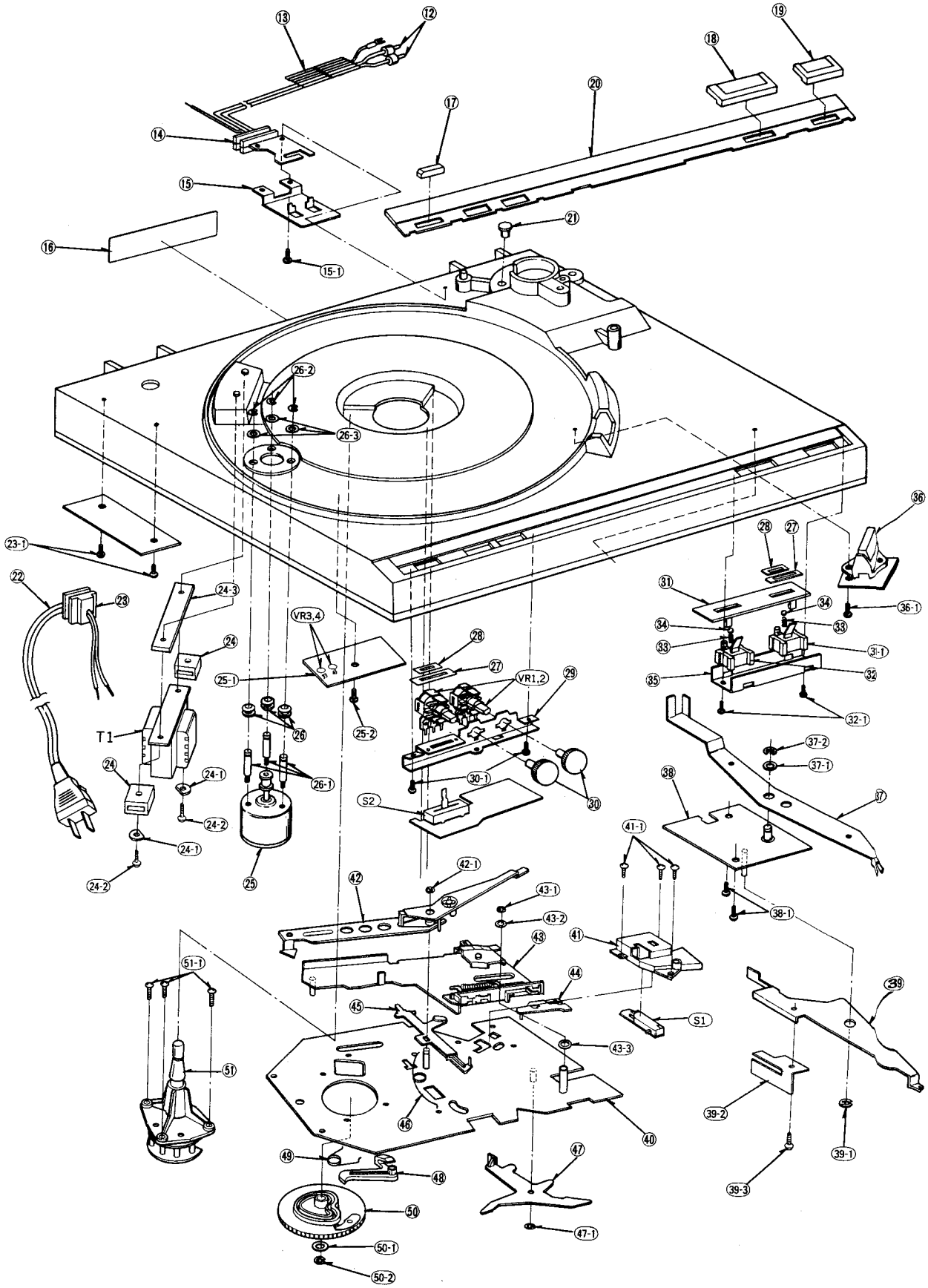
(E), (X), (XAL), (XG), (XGF)

★ This parts list includes only the changes of the SL-220 (X), (XAL), (E), (XGE), (XG), (XGF) parts list.
★ When servicing model SL-221, this parts list and SL-220 (X), (XAL), (E), (XGE), (XG), (XGF) parts list should be used together.

■ CHANGE OF PARTS FROM SL-220 (X, XAL, E, XGE, XG, XGF)

Ref. No.		Part No.	Part Name & Description
CABINET and CHASSIS PARTS			
6		SFAC212K01	Cabinet
PACKING PARTS			
P1 [E,X,XAL, XG]		SFHP223X01	Carton
P2 [XGF]		SFHP223J01	Carton
SWITCHES			
S1 [X,XG, XGF]		SFDSAH764039	Switch, Power
S1 [E,XAL]		V-1A445	Switch, Power

■ EXPLODED VIEW

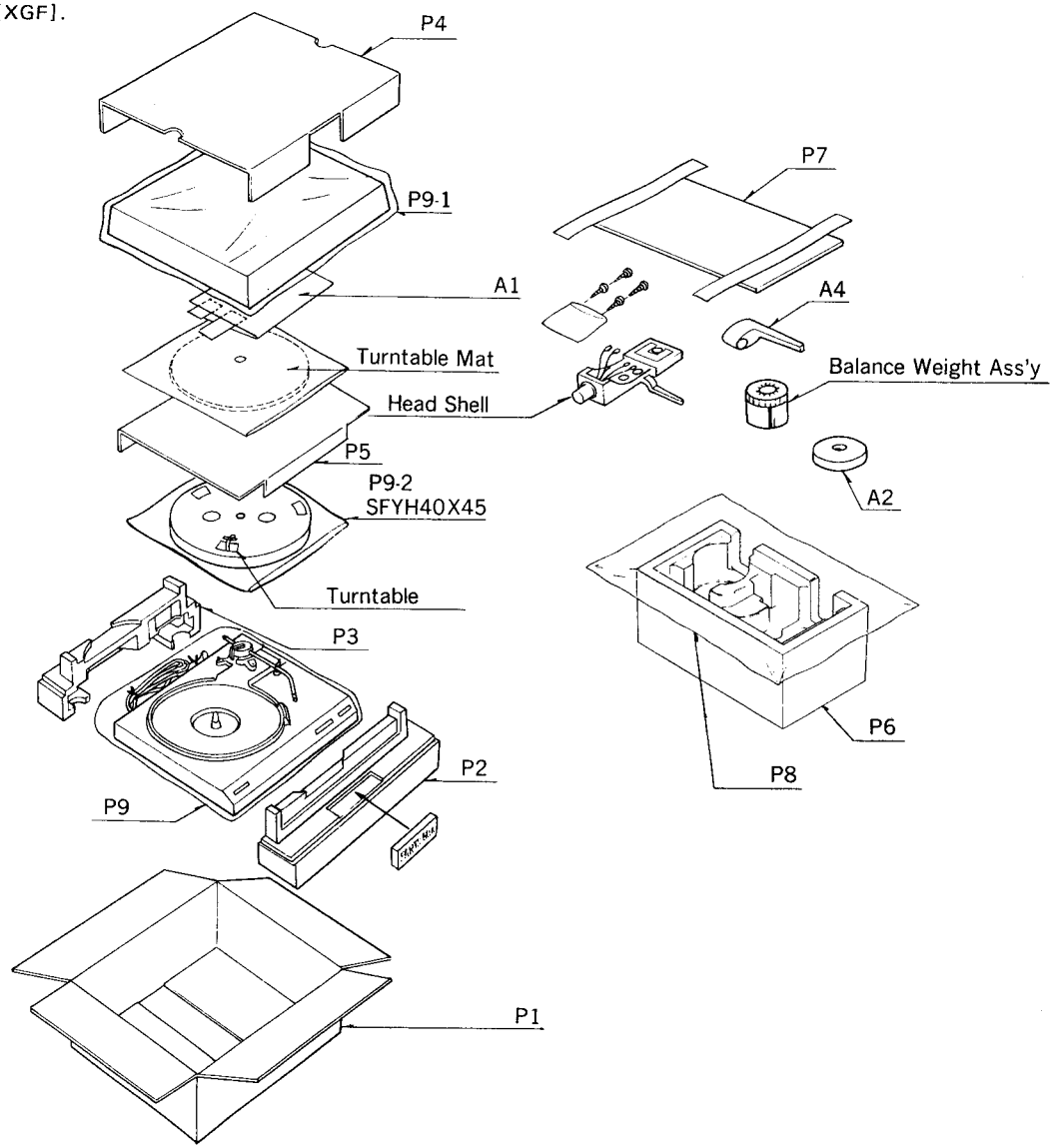


■ REPLACEMENT PARTS LIST

Notes: 1. Part numbers are indicated on most mechanical parts.
Please use this part number for parts orders.
2. SL-220 (X)→[X], SL-220 (E)→[E], SL-220 (XG)→[XG].
SL-220 (XAL)→[XAL], SL-220 (XGE)→[XGE], SL-220 (XGF)→[XGF].

Ref. No.		Part No.	Part Name & Description
ACCESSORIES			
A1 [Except XGE]		SFNU222X01	Instruction Book
A1 [XGE]		SFNU222G01	Instruction Book
A2		SFWE212-01	Adaptor, 45 r.p.m.
A3 [XGE]		SFPEN3302	Nut, Cartridge
A3-1 [XGE]		SFPEW9601	Washer, Head Shell
A3-2 [XGE]		SFPEV22101	Screw, Cartridge
A3-3 [XGE]		SFPEV7803	Screw, Cartridge
A3-4 [XGE]		SFYF05A06	Polyethylene Bag
A4 [XGE]		SFKO135X01E	Overhang Gauge
A5		SFDK100G	Adaptor, DIN-PIN
A6 [X]		SFDKI19118	2-PIN Plug
PACKING PARTS			
P1 [Except XGF]		SFHP222X01	Carton
P1 [XGF]		SFHP222J01	Carton
P2		SFHH212-01	Pad, Front
P3		SFHH212-02	Pad, Rear
P4		SFHD212-01	Pad, Top
P5		SFHD212-02	Pad, Turntable
P6		SFHH212-03	Parts Box
P7		SFHD212-03	Pad, Top, Parts Box
P8		SFYC22A30	Polyethylene Cover, Parts Box
P9		SFYF60A60	Polyethylene Bag, Player Unit
P9-1		SFYH60X60	Polyethylene Bag, Dust Cover
P9-2		SFYH40X45	Polyethylene Bag, Turntable
P9-3		SPP189	Polyethylene Bag, Cord

■ PACKING



SL-220

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